

The Science Teacher

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APRIL



International conference on Science Clubs in Paris, France, is addressed by Dr. Jaime Torres Bodet, of Mexico, Director General of Unesco. Seated, left to right: Dr. Pierre Auger of France, head of the Unesco department of natural sciences and Borge Michelsen of Denmark, Maurice Goldsmith of England, members of that department.

(Courtesy of Science Service)

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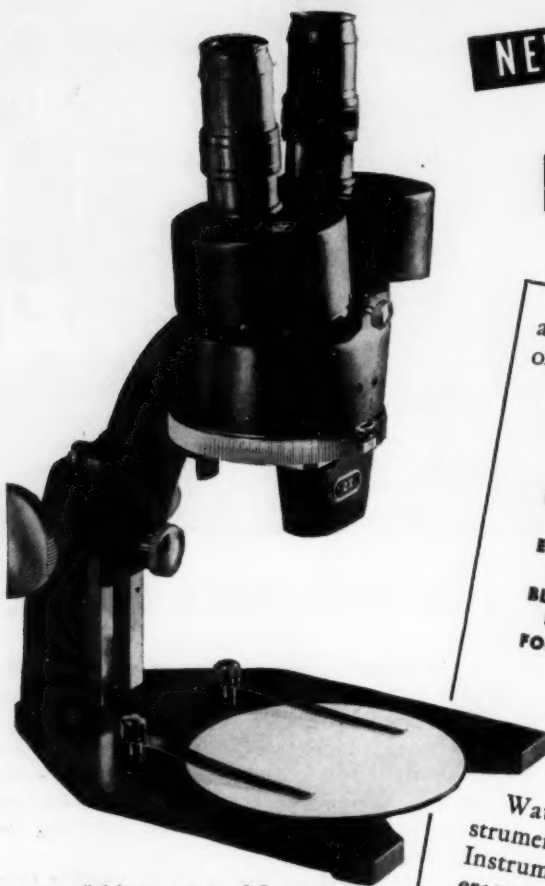
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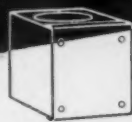
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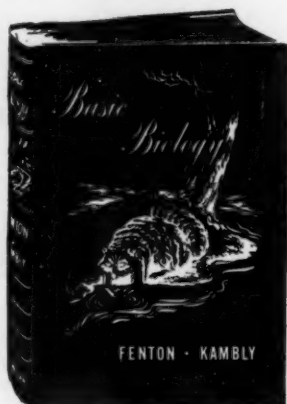


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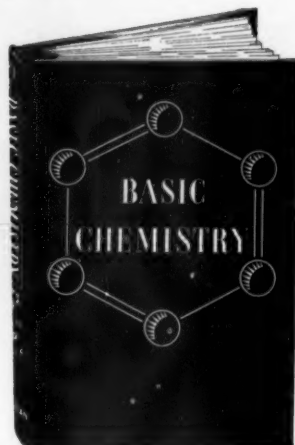
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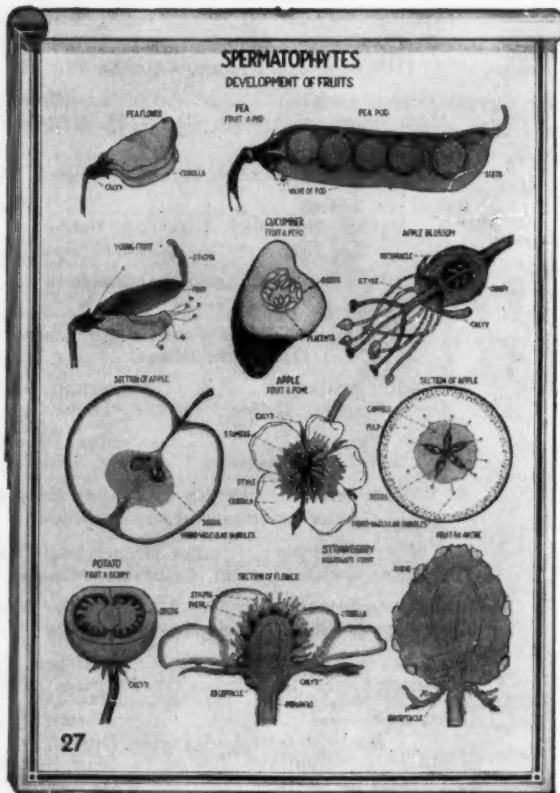
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The Science Teacher

VOLUME XVI

OCTOBER, 1949

NUMBER 3

Not Only Fleas To Bite 'Em!

LELAND SHANOR

Associate Professor, Department of
Botany and Curator of Mycological
Collections
University of Illinois

Biology students sooner or later are introduced to the familiar lines

"Great fleas have little fleas upon their
backs to bite 'em,

And little fleas have lesser fleas and so
ad infinitum"

The impression often left by this statement is that the parasites involved are likely to be either insects or arachnids, or at least to be animal in nature. Students, therefore, may not realize that other groups of parasites as well may occur on insects and arachnids. Actually, probably only a comparably small group of specialists is aware of the numerous

Fig. 1. *Cordyceps militaris*. Three fruiting bodies arising from a buried pupa of a moth. x2.



Fig. 2. *Cordyceps melalonthae*. A single large fruiting body developed from parasitized larval stage of May Beetle. x1.

fungi, which belong to the plant kingdom rather than the animal kingdom, that parasitize insects, representing almost all of the insect orders, and also many of the Arachnida (spiders, ticks, scorpions, etc.) Some of these parasitic fungi are sufficiently large to be detected without a magnifying lens but others are so small that they cannot be seen or certainly not well appreciated without the aid of a compound microscope. In many cases these parasites eventually kill the host on which they occur, but others, although obligate parasites, are thought to cause no more than a slight irritation if even that much inconvenience. A student who is collecting insects and is aware of the curious fungal parasites which occur on many of them, might be interested in looking for such parasites and learning more about them.

Fungi, including those which are insect parasites, are characterized by a lack of the

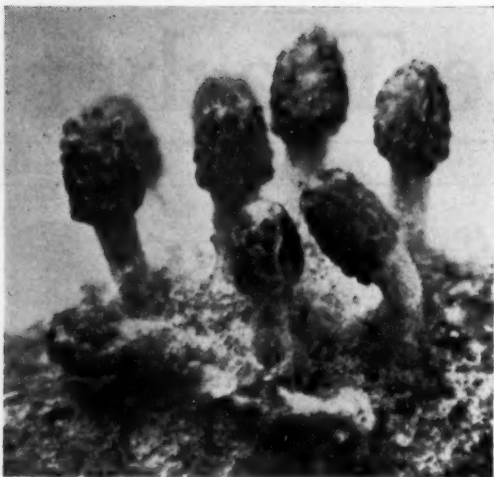


Fig. 3. *Cordyceps clavulata*. A single scale insect with a number of fruiting bodies of the parasite. x20. (Courtesy Professor E. B. Mains)

green pigment, chlorophyll, which gives the typical color to higher plants, the pond scums and other Algae, the plants which fungi most nearly resemble because of their relatively simple structure and somewhat similar methods of reproduction. There is wide variation in form and organization from one group of fungi to another but in general fungi possess a basic filamentous structure which can be seen readily when they are examined with a microscope. Some fungi, such as the yeasts, may consist only of a single cell or a small number of cells which remain together as a colony. The filaments of fungi are called hyphae and in many groups these are complexly organized into such structures as mushrooms, puff-balls, stink-horns, and brackets, or are only moderately differentiated to carry out the functions of reproduction as in the fungi called "Molds."

Since fungi lack chlorophyll they are unable to manufacture their own food and must obtain it from some external source. To do this they must produce a diversified group of enzymes to break down the complex carbohydrates (such as starch and cellulose), the fats and oils, and the proteins of plant and animal bodies, into simpler soluble substances which they can absorb and utilize for energy, growth and reproduction. The fungi which parasitize insects produce such enzymes which are employed in enabling them to utilize the

fatty and proteinaceous substances of insect bodies. Only a very small number of entomogenous fungi appears to be able to derive any nourishment from the skeletons of their hosts.

The principal reproductive structures of fungi are called spores. These are microscopic in size and are commonly single-celled or made up of a small number of cells. Most spores function primarily in enabling a species to become more widely distributed in nature but there are types of spores which enable the species to survive unfavorable conditions. Fungi, in general, are well adapted for the dissemination of spores, and in entomogenous species, special modifications or adaptations for this purpose may have developed. The ordinary agents of nature, such as air currents and water, are utilized fully. In the case of many of the wind disseminated species, spores are often discharged with some force so that they are projected out into the air currents and thus are more likely to be carried away. Spores are usually produced in great quantities.



Fig. 4. *Cordyceps viperina*. A single fruiting body arising from larva of a beetle. x2½. (Courtesy Professor E. B. Mains)

The social habits of some host species aid greatly in the spread of certain parasites. Spores may be provided with a sticky substance which enables them to adhere to the body of an insect when an infected one comes in contact with another. Other insects are naturally cannibalistic and eat the weaker members of a population; thus if the weakened condition is due to a parasitic organism, non-infected individuals, because of this practice, may become infected by consumed spores. Spores may be present also on leaves or other items serving as food for insects and are then

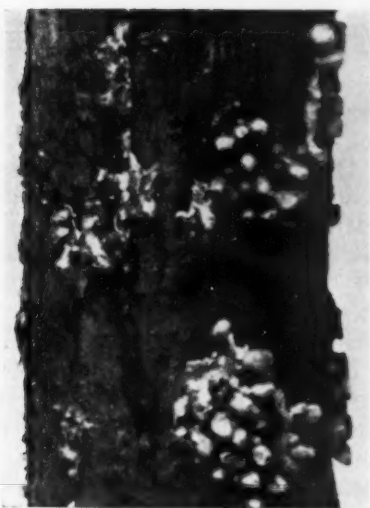


Fig. 5. *Podonectria coccicola*. Numerous fruiting bodies developed on scale insects. x3.

ingested with food materials.

Entomogenous fungi are widely distributed in nature but a larger number of species is known from tropical regions than from temperate climates. This is undoubtedly due largely to the prevailing higher relative humidity and consequently higher temperatures in the tropics, since these factors greatly influence the development of fungi generally. At the present time approximately two thousand species of fungi are known which are capable of actively parasitizing insects, and many others have been described which are associated with dead insects or insect castings.

The largest and most widely known of the entomogenous fungi belong to the genus *Cordyceps* and have been popularly designated as "Vegetable-Wasps" or "Plant-Worms." In the Orient, one species was formerly highly prized because it was regarded as having some medicinal value when cooked in the flesh of fowl, imparting to the meat some remedy for body debility. There appears to be no scientific basis for the idea that *Cordyceps* is of medicinal value.

Several species of *Cordyceps* are widespread in their distribution and some of them are frequently collected. *Cordyceps militaris* (Fig. 1) produces orange to reddish-orange club-shaped fruiting bodies with the area in which the spores are formed occupying the apical portion. This species is most often found on larvae and pupae of Lepidoptera (moths and

butterflies) but has been reported on other hosts also. *Cordyceps melolonthae* (also known by the name *Cordyceps herculae*) (Fig. 2) is not infrequently collected on the grubs of "June Bugs" (May Beetle) and of other large coleopterous insects. It is one of the larger species, sometimes producing a fruiting body up to 3 inches in height. These are tan-colored and somewhat yellowish in the area producing spores with a lighter sterile portion at the tip and forming the stalk.

A very small species, *Cordyceps clavulata* (*Ophiocordyceps clavulata*), is found on scale insects (Fig. 3) and is widely distributed in the United States, often causing epidemics. From three to eight or more small stalked fruiting bodies develop from each infected scale.

Other species of the genus *Cordyceps* occur on wasps, ants, cicadas, flies, and other insects but the greatest number of species has been found on larvae of various beetles (Fig. 4) and on the larvae, pupae, and adults of lepidopterous hosts.

Belonging to the same order of fungi to which *Cordyceps* belongs are several species which parasitize scale insects and which have assumed some economic importance. Two of these are *Sphaerostilbe auranticola* and *Podonectria coccicola* (Fig. 5), both of which produce numerous, small, brightly-colored, fruiting bodies on infected scales. Other species of *Sphaerostilbe* and of *Podon-*

Continued on Page 146

Fig. 6. *Empusa (Entomophthora) sepulchralis*. Two crane flies attached to fragments of bark with bodies almost covered by growth of the fungus. x1.



President's Page By Nathan A. Neal

SPECIAL committees for the year include the following: Bulletins, International Relations, Affiliates, Apparatus and Equipment, Atomic Science Education, and Television. If you are interested in serving on any of these committees or if you have suggestions for other committees which are needed to deal with special problems, please write to Executive Secretary Robert H. Carleton. These working committees are the backbone of our professional organization. If it is not practical for you to serve on a committee, any ideas which you have for furthering their work are welcome indeed. Similarly, suggestions on any of the activities of NSTA will receive serious and prompt attention by the headquarters office.

The standing membership committee is composed of the general vice-president and the four regional vice-presidents. State and area workers in cooperation with this standing committee are responsible for a very large part of the present membership. Many people have been asked to participate in membership work this year. If you have not received a special invitation and could call favorable attention to NSTA at a local or regional conference, you are urged to do so. If you would like to have printed materials on membership, the headquarters office will supply you immediately.

High on the agenda for the year is the stimulating problem of NSTA journal ownership. Our organization is now comparable in most respects to the national councils in other major subject matter areas except in the matter of its official magazine. John C. Chiddix is owner and manager of *The Science Teacher*, which has served as the official journal during the past five years. Mr. Chiddix has cooperated most effectively in building NSTA to its present position. The organization could not have grown so rapidly without his continued professional assistance. However, he now joins the NSTA board of directors in believing that the time has come for

the association to publish its own official organ. The present year is the last during which the existing relationship between NSTA and *The Science Teacher* will continue. Two major alternatives are open to the board of directors. One is to offer to purchase *The Science Teacher* from the present owner. The other would be to start an entirely new NSTA magazine. Which would you prefer? In either case, it is anticipated that the school year 1950-1951 will get under way with a monthly official journal. The official journal committee, of which Hanor A. Webb is chairman, is studying the various questions which must be answered in order to achieve this goal. Who will manage and edit our monthly magazine? What format is desirable? Where shall it be printed? What advertising policies shall be adopted? Are new types of articles needed? You are especially invited to write your suggestions for the official journal committee to the headquarters office.

THE NSTA Packet Service directed by Bertha E. Slye is one of the most valued services to members. It not only provides up-to-date science information for those whose dues are paid but also interests an increasing number of new members. The Advisory Council on Industry-Science Teaching Relations, under the leadership of Dr. Morris Meister, is conducting studies which may well lead not only to the improvement of our packets but the improvement of all commercially sponsored low cost and free educational materials as well. One Advisory Council study is completed and a report which you will receive is now being prepared. This study deals with the types of uses which teachers have made of packet items. A second study is projected for the near future to investigate neglected areas in which commercially sponsored teaching materials are needed or would be used. If you should receive a questionnaire in connection with this second study, your cooperation in completing and returning it should help to improve our already valuable Packet Service.

THE SCIENCE TEACHER

The Directors Meet

HANOR A. WEBB

Secretary of NSTA

THE OFFICERS and directors of the National Science Teachers Association are required by the NSTA constitution to meet twice a year. The summer meeting is usually held in connection with the National Education Association, while the winter meeting is at the time and place of the sessions of the American Association for the Advancement of Science. The NEA and the AAAS are "parents" of the NSTA—a truly lusty and growing "child."

A directors' meeting of NSTA must consider many small details, but some significant actions are also taken. Among the more important reports, actions, and resolutions of the summer meeting in Boston, July 2-4, were the following:

Membership. The executive secretary, Robert H. Carleton, reported a total membership of 4,405, an increase of 23 per cent over last year. More than 1,000 of these are first-time members. There should, however, be 10,000 members from the 30,000 science teachers of our nation.

Finances. The association balance and receipts for the year were \$45,020.27; expenses, \$31,267.05; balance to 1949-50, \$13,753.22. Membership dues, however, accounted for only \$9,536.85 of this amount, the rest coming from industry and from the National Education Association as grants-in-aid or payment for Packet Service. The cost per member for *The Science Teacher*, programs, election ballots, notices of dues, etc., is \$1.63 out of the \$2.00 dues. All of the packets, and the salaries of the Headquarters staff, must be paid from other sources at present. None of these sources are guaranteed.

Legislation. Letters were written to members of Congress in the name of NSTA, favoring (a) the principle of federal aid to education, and (b) the establishment of a National Science Foundation.

Winter meeting. A varied and interesting program is planned for the winter meeting of NSTA in New York City, December 27-30,

1949. Three organizations—the American Nature Study Society, the National Association of Biology Teachers, and the National Science Teachers Association—will cooperate in a series of separate and joint meetings and exhibits. These meetings will be open to all science teachers.

Election. The directors confirmed the election of officers and directors, which was completed by mail ballot in May. The officers for 1949-50 are these: *retiring president*, Norman R. D. Jones of St. Louis, Mo.; *president*, Nathan A. Neal of East Orange, N. J.; *president-elect*, Ralph W. Lefler of West Lafayette, Indiana; *vice-president*, Arthur O. Baker of Cleveland, Ohio; *secretary*, Hanor A. Webb of Nashville, Tenn.; *treasurer*, Elbert C. Weaver of Andover, Mass.; *eastern vice-president*, Walter S. Lapp of Lansdale, Pa.; *north central vice-president*, Kenneth Vordenberg of Cincinnati, Ohio; *southern vice-president*, Greta Oppe of Galveston, Texas; *western vice-president*, Archie MacLean of San Gabriel, California.

Directors, elected for various terms, are these: Maurice U. Ames (1949-50), New York City; Anna E. Burgess (1949-51), Cleveland, Ohio; Ira C. Davis (1949-52), Madison, Wisconsin; Philip G. Johnson (1949-52), Washington, D. C.; Betty Lockwood (1949-52), New York City; Morris Meister (1949-52), New York City; S. Ralph Powers (1949-52), New York City; Dorothy T. Tyron (1949-50), Detroit, Michigan; Harold E. Wise (1949-51), Lincoln, Nebraska.

Hold-over directors and the expiration dates of their terms are as follows: Glenn Blough (1951), Washington, D. C.; Charlotte L. Grant (1950), Oak Park, Illinois; Dwight E. Sollberger (1951), Indiana, Pa.; Leo J. Fitzpatrick (1951), Brockton, Mass.; Hugh C. Muldoon (1950), Pittsburgh, Pa.; Frances Miner (1950), Brooklyn, N. Y.

Research. Research Study No. 1, developed by a committee of the Advisory Council on Industry-Science Teaching Relations, relates to the use of NSTA packet materials by science teachers. A comprehensive questionnaire was distributed last spring, and a satisfactory number of returns received. These are being

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Use of Magnesium Sulfate Crystals for Determining Formula of Hydrate*

B. E. SCHULZE

*Del Mar College
Corpus Christi, Texas*

MAGNESIUM sulfate crystals possess certain properties that make their use desirable in demonstrating the quantitative relations that exist in hydrates.

A clean, dry porcelain crucible and lid are prepared in the usual manner. After weighing the empty crucible and lid to the nearest centigram on a triple beam balance, six to nine grams of magnesium sulfate crystals are added. The weight of the sample is obtained and heating is begun. Five or six minutes of gentle heating and ten or twelve minutes of intense heating usually complete the expulsion of all the water of hydration. The results of a typical experiment in which U.S.P. magnesium sulfate was used follow:

Data*

Weight of crucible and hydrate	27.14 g.
Weight of crucible empty.....	18.71 g.
Weight of hydrate.....	8.43 g. (A)
Weight of crucible and hydrate	27.14 g.
Weight after first heating.....	22.84 g.
Weight after second heating.....	22.84 g.
Weight after last heating.....	g.
Weight of water after hydration	4.30 g. (B)
Per cent of water in the hydrate = $\frac{(B)}{(A)} \times 100 = 51.0\%$	(C)

*The form of the data table is a variation of one by Babor and Lehrman (Thos. Y. Crowell Co.) in *Laboratory Manual for Introductory College Chemistry*.

DIRECTORS MEET

Continued from Page 119

tabulated, and a report will be made in due time. Other research studies concerning materials to be supplied by industry for the use of science teachers are under way.

Resolutions. The resolutions adopted by the directors were worded to favor (a) a National Science Foundation; (b) science "cores" or "constants" in the curricula of all

Per cent of anhydrous salt in the

hydrate = $100 - (C)$, or 49.0% (D)

$$\frac{(C)}{\text{Mol. wt. of HOH}} = \frac{51.0}{18} = 2.83 \text{ (E)}$$

$$\frac{(D)}{\text{Formula wt. of anhyd. salt}} = \frac{49.0}{120.4} = .407 \text{ (F)}$$

$$\text{Ratio } \frac{(E)}{(F)} = \frac{2.833}{.407} = 6.96$$

Formula of hydrate is $\text{MgSO}_4 \cdot 7\text{HOH}$

Mean of twelve trials with mean deviation as obtained by a class of first semester freshman chemistry students.....7.04 \pm 1.0%

Variation of mean from the theoretical.....0.5%

Advantages

THE HYDRATE, magnesium sulfate, is relatively inexpensive. Five pounds of U.S.P. grade can be obtained for 25 cents. The type of balance used is inexpensive, and hence a sufficient number may be purchased to prevent "bottlenecks" in the weighing room. The hydrate is stable enough at ordinary temperatures. No drying of the salt at 100-150° C appears necessary. In fact, the hydrate is at least partially dehydrated at 100° C. The dehydration proceeds quietly, and there is little or no evidence of spattering or loss of particles by too sudden intense heating. The use of a larger weight than the usually recommended quantity of one or two grams has a definite psychological value for many beginning students of chemistry who are not accustomed to handling small quantities.

elementary and secondary schools; (c) medical research unhampered by restrictions on the use of experimental animals; (d) freedom for the interchange of scientific information, except where national security is involved.

Regional meetings. Earnest consideration was given by the directors to plans for regional meetings of the National Science Teachers Association.

THE SCIENCE TEACHER

Experiments in Illumination

W. E. MILLER

Assistant Professor, University of Illinois

Concluded from April issue

Introduction

THE LIGHT emitted by an artificial source of illumination usually cannot be used effectively to provide a desirable quality of illumination on the working surface. Too much light is directed into the eyes of the worker causing glare; too much is directed to the walls and ceiling of the room instead of being directed to the working surface. The work of the illuminating engineer is to control this light by designing luminaires, planning their installation and advising of the use of these luminaires so that the light emitted by the bare lamp may be redirected and utilized to give better quality illumination. While it is not possible to treat all phases of illuminating engineering in this series of articles, it is hoped the reader will gain an understanding of the fundamentals of light con-

trol and the tools with which the illuminating engineer has to work.

The design of luminaires incorporates the principles of reflection, refraction and transmission of light by using a combination of transparent, translucent and opaque materials in the manufacture of the unit. The distribution of light from the luminaire depends upon the manner in which these materials are used, and is shown by the use of the candlepower distribution curve of the unit. By using the zonal lumens method, discussed in Article III of this series (*The Science Teacher*, Vol. XVI No. 2, April, 1949) the lumens emitted by the luminaire in the lower ($0-90^\circ$) hemisphere and the upper ($90^\circ-180^\circ$) hemisphere can be found from the information obtained from the distribution curve. Luminaires are classified according to the percent of the total luminaire output emitted in each hemisphere. These general classifications with the percentage of luminaire output in the upper and lower hemispheres are given in Table I.

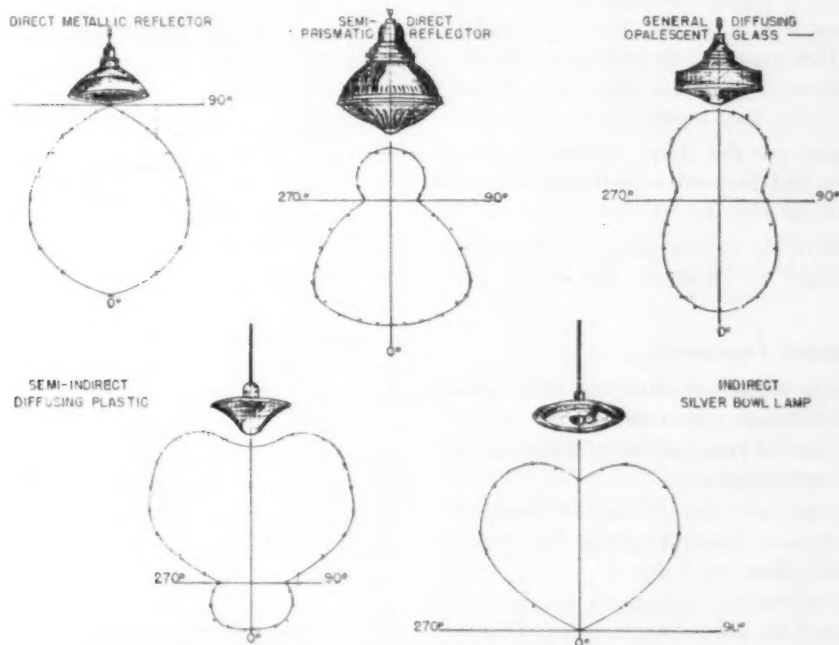


FIG 1 GENERAL CLASSIFICATION OF LUMINAIRES

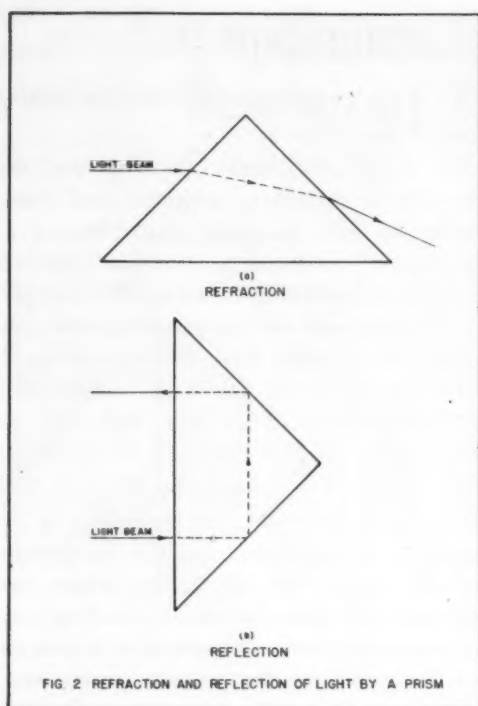


Table I

Type of Luminaire	Percent lumens in lower Hemisphere	Percent lumens in upper Hemisphere
Direct	90-100	10-0
Semi-direct	60-90	40-10
General Diffusing	40-60	60-40
Semi-indirect	10-40	90-60
Indirect	0-10	100-90

Examples of the five classifications of luminaires and respective distribution curves are shown in Fig. 1.

The following outline suggests experimental procedure to illustrate the above principles.

Recommended Equipment

1. Opaque samples showing specular, spread and diffused reflection.
2. Samples of transparent, translucent and opaque materials.
3. A prism and sharply focused flashlight.
4. Luminaires illustrating the five general classes given in Table I.
5. A distribution photometer as described in Article III (*The Science Teacher*, Vol. XVI, No. 2, April, 1949).

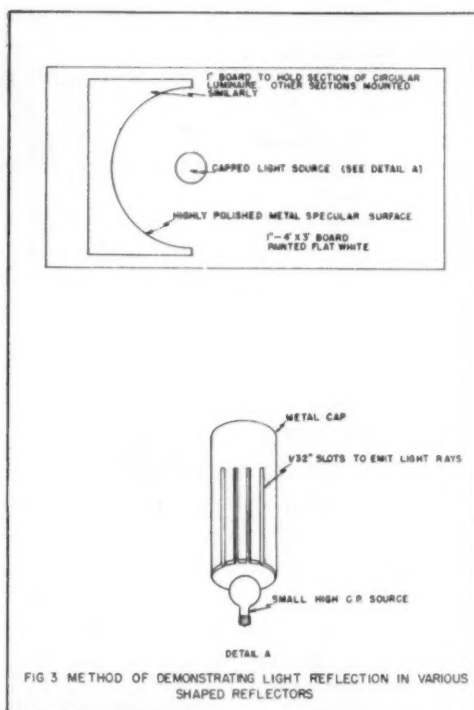
6. A light ray demonstrator as shown in Figure 3.

Discussion of Procedure

GLARE is one of the most objectionable characteristics of a poor lighting installation. To illustrate the effect of glare, a hole 1 inch in diameter may be cut in the center of a typed page mounted on cardboard. Holding the page between the observer and a strong light source, adjust the page until direct rays from the light source penetrate the hole, striking the observer in the eyes. Notice the difficulty in reading the paper. Then, move the page until the light no longer strikes the observer in the eyes. Reading the page is much easier.

Reflection is a very important factor in the design of a good lighting installation, since a high reflection factor indicates a low absorption factor; any light absorbed by a surface is, of course, lost. The reflection factor of the various parts of a luminaire, of the ceiling and sidewalls of a room, of the furniture in the room, etc., must all be considered in making a lighting installation. Reflections

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Chats With Science Teachers

The Classroom Diary

Keeping a diary (Latin, "day-by-day affair") has long been a practice of thoughtful people, including statesmen, generals, and ladies-in-love. I have found useful applications of the diary in many science classes, at various levels. A majority of the students have liked the plan. I believe it would serve well in history, literature, and other classroom subjects.

Certain "rules" seem appropriate to the science classroom diary:

1. *The diary selects the most significant and interesting items of an hour's discussions and demonstrations.* "Of all that was said and done in that period, what was most worth remembering?"

2. *The diary is to be written later in the day, during a study period at school or at home.* Class notes may be taken during the science hour if desired, but these do not constitute the diary. "Remember what's best and forget the rest."

3. *The diary may contain expressions of certain most worthy topics, according to the student's own interest, information, and imagination.* "Write as much as you like about what you liked most."

4. *The length of the diary may vary from one-half page (written by students who recall practically nothing of value in the period) to as many pages as the enthusiastic student desires to write.* "Anybody may turn in half a page now and then, but to do this every day—that looks bad!"

5. *The diaries are due, and are taken up, on the class period of the next school day.* Tardy diaries are accepted only on explained emergency. Diaries are returned, after reading by the teacher, once a week (as on Monday). "It was really fun to learn what you are thinking, as you tell it in your diary."

Diaries should not be graded too meticulously. Three marks, indicating "Superior," "Satisfactory," and "Unsatisfactory" should be enough. Reading diaries should not become a burdensome chore. Experienced teach-

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Secretary, National Science Teachers Association

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ers can—and should—read them very rapidly. To the practiced reader "something different" will stand out on the page as if in red letters.

6. *Each student should preserve his diary in a folder or envelope, with the sheets in proper order.* "Your diary will surely help you on your next examination—and it may help you as long as you live. So don't lose it."

Advantages to Students

As in all earnest plans for teaching, this device is primarily for the student's benefit. Here are some services of the classroom diary:

1. *The diary develops habits of attention and discrimination during a period's activities.* "If you don't see something when it happens, how can you remember it afterward?"

2. *The diary gives practice in calm afterthought concerning things that were presented during some excitement, and possibly confusion.* "You have more sense after you settle down."

3. *The diary develops skill in written description and summation.* The notorious aversion of many students to written reports is often greatly altered by their personal interest in their own diary. "Even wise men think with their pens."

4. *The diary supplements—and usually enriches—the text and manual as material for review when examinations impend.* "The book you have written—your diary—is worth as much as your text book—maybe more! Study both of them."

Advantages to the Teacher

What is good for the student is usually good for the teacher, too. The classroom diary may aid the science teacher in these respects:

Continued on Page 147

Audio-Visual Aids

EDITED BY CHARLES R. CRAKES

The editor of this department will attempt to bring before the readers of this publication the latest articles written by science teachers who are making effective use of various forms of audio-visual teaching materials. He will also endeavor to present a cross-section of educational opinions on audio-visual aids he may gather in traveling about North America.



GEORGE G. MALLINSON

THE ARTICLE this month is entitled "Errors and Misconceptions in Films for Science" and is written by Dr. George G. Mallinson, Associate Professor of Psychology and Education, Western Michigan College of Education, Kalamazoo, Michigan, who is well known to the science teachers of America.

Dr. Mallinson received both his B.A. and M.A. degree in science at New York State Teachers College, Albany, New York. His Ph.D. was received at the University of Michigan, Ann Arbor, Michigan.

From 1938 to 1941, he served as Instructor of Science at Whitesboro High School, Whitesboro, New York. From 1941 to 1942, he served as Chairman of the Science Department, Eden High School, Eden, New York. From 1947 to 1948, he served as Assistant Professor of the Teaching of Science, Iowa State Teachers College, Cedar Falls, Iowa.

At present, he is serving on the staff at Western Michigan College of Education, Kalamazoo, Michigan.—C. R. Crakes.

Errors and Misconceptions in Films for Science

GEORGE G. MALLINSON

*Western Michigan College
of Education
Kalamazoo, Michigan*

THE Thirty-first¹ and Forty-sixth² Yearbooks of the National Society for the Study of Education emphasize among the objectives of the teaching of science three of major importance. They are the development of functional understandings of the major principles of science of value for general education, the inculcation of the scientific attitudes, and training in the skills of the scientific method. The learning experiences in the classroom should be selected for their contributions to the attainment of these objectives. Such ex-

periences may include discussions, experiments, field trips and the use of motion picture films.

Motion picture films should be chosen for, and evaluated in terms of, their contributions to the above objectives. The choice of the film, then, should be based upon the following criteria:

1. The film shall contribute experiences of direct pertinence to the desired objectives.
2. The information in the film shall be scientifically accurate.

1—"A Program for Teaching Science," *Thirty-first Yearbook of the National Society for the Study of Education, Part I*. Chicago: Distributed by the University of Chicago Press, 1932. xii + 369 pp.

2—"Science Education in American Schools," *Forty-sixth Yearbook of the National Society for the Study of Education, Part I*. Chicago: Distributed by the University of Chicago Press, 1947. xii + 306 pp.

3. The information shall be presented so as to avoid misconceptions.

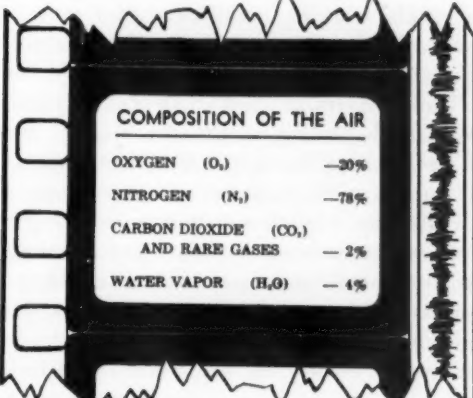
THE preview should be used for evaluating the film in terms of these three criteria. It has been the experience of the author, however, that the preview is generally used for evaluating the film only with respect to its pertinence to the objectives at hand. A great number of teachers assume, and perhaps with justice, that films contain information which is accurate, and which is presented so as to avoid misconceptions. There is ample evidence, however, that there are inaccuracies in films and that sections of some films are likely to cause misconceptions in the minds of the students. Films need to be examined carefully to detect these flaws. The recent *Teaching Films Survey*³ indicates this clearly. It presents evidence to show that from 16%-31% of the elementary-school teachers surveyed criticized films adversely with respect to these points, while 26%-29% of the secondary-school teachers did likewise.

The need for previewing films to locate inaccuracies and possible misconceptions has been noted further by the author while examining films for use in high school science. Many of the films which were examined contained information which was erroneous, and

3—Committee of Publishers (Philip A. Knowlton, Compiler), *A Report to Educators on Teaching Films Survey*. Conducted and published by Seven Publishers of Educational Books. New York: Harper and Bros., 1948. p. 117.

4—Mallinson, George G. and Gjerde, Waldemar C., "Motion Pictures for High School Science," *School Science and Mathematics*. XLVIII (October 1948), 525-34.

A section from a film slide illustrative of errors that sometimes occur. Note percentage composition.



COMPOSITION OF THE AIR		
OXYGEN (O ₂)		—30%
NITROGEN (N ₂)		—78%
CARBON DIOXIDE (CO ₂) AND RARE GASES		— 2%
WATER VAPOR (H ₂ O)		— 4%

OCTOBER, 1949

also presented information in a manner likely to cause misconceptions in the minds of the students.

Among the more glaring errors in information are the following:

A rather popular film dealing with air listed its composition as oxygen 20%, nitrogen 78%, carbon dioxide and rare gases 2%, and water vapor up to 4%. If the water vapor were at maximal content, the components of air would be 104% of its volume.

ANOTHER film dealing with food and nutrition states that "fats are carried from the villi of the small intestine upward through the thoracic duct, and are dumped into the *jugular vein*." The thoracic duct empties its contents into the *subclavian vein*, not the jugular vein. The point of junction is near that of the jugular vein, but they do not unite. This same film states that "when one-fifth of the air is used up, life or flame goes out." This assumes that life or flame will continue until the oxygen (one-fifth of the air) is totally exhausted. The simple experiment using a lighted candle, a cork, a pan of water and a fruit jar will indicate a falsity of this assertion. In this film it is also stated that "carbon dioxide is *absorbed* by a solution of calcium hydroxide." The use of the word "absorbed" is erroneous when applied to this chemical reaction.

Another film indicates that the "action of the diaphragm *draws* air into the lungs" and at another point states that "air is *sucked* into the lungs." This film offers support to the thesis that "Nature abhors a vacuum."

The nucleus of the hydrogen atom is shown as small compared with the single orbital electron in a film dealing with atomic energy. The nucleus, actually a proton, has a mass approximately 1,850 times as great as that of the orbital electron.

The errors just cited represent less than one-tenth of those found in the films which were reviewed.

THE SECOND weakness—presentation of material in a manner likely to cause misconceptions—occurs much more frequently. In some cases it is difficult to draw a line of demarcation between this weakness and actual

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error. Many of these errors arise from sweeping generalities or failure to edit aspects of the film which at the time are not the primary focus of attention.

One film, using animation to illustrate the attack of corpuscles on "invading germs," uses the color *red* to identify the corpuscles. The agents in the blood which do "attack germs" are never mentioned specifically, but it would seem likely that students would identify the "red attackers" as the red corpuscles. This same film emphasizes the fact that "vaccination makes the body immune to diseases." Smallpox is not mentioned, nor is any other disease. The connotation of "complete immunity" could result easily.

Students are informed also that the Mississippi and its tributaries cannot be controlled, and that the only way to avoid annual flooding is to live elsewhere than on the present flood plain. There are few persons with scientific attitudes who will agree with the original thesis, and fewer who will be satisfied with the remedy.

A SCENE in one film depicts a man of rather advanced age in the process of chopping wood quite vigorously. The film cites this activity as an example of an "increase in muscular energy." While the example may be correct, the type and extent of the activity are not likely to be recommended for men of advanced age. This film also refers to the "salt deficiency in nutrition." Previously, there had been discussion of NaCl, and of "mineral salts." The "salt deficiency," discussed somewhat at length, is identified with neither.

The Schaefer method of artificial respiration as presented in another film would hardly be considered desirable. The tongue of the drowned person was not moved forward, the face was almost directly in the dirt, and the artificial respiration was applied with sufficient vigor to have broken several ribs, and at a cadence double that of normal breathing.

The term "condensation" is used rather loosely in one film. The combining of four hydrogen atoms to form one helium atom is referred to as "condensation." Later the splitting of uranium and the subsequent release of energy is referred to as "condensation." The latter usage is probably quite er-

roneous, the first somewhat misleading. This film also states *definitely* that the sun's energy is caused by the "condensation" of four hydrogen atoms into one helium atom. There is still considerable controversy with respect to the source of the sun's energy. The film also indicates that sunlight "raises" electrons to higher energy levels, and that the energy obtained by burning wood comes from this "raising" of electrons. The latter part of this statement is open to considerable argument.

WITHOUT disputing the desirability of teaching the subject-matter materials found in these films, it can be stated that if they are to be used they should be free from error, and presented in such a manner as to avoid misconceptions. It would seem, however, on the basis of the above information that this is not true. Two recommendations are obvious:

1. More care should be taken by film publishers to present films that are scientifically accurate, with materials carefully presented.
2. Until such films appear, the film should be examined carefully during the preview to locate inaccuracies, and points likely to cause misconceptions, so that they may be brought to the attention of the student.

New Films

Your Editor has recently previewed several excellent films and filmstrips which should prove of interest to science teachers.

THE MAGIC OF FLUORESCENCE—(16 mm color; length 17 min.)—produced and distributed by General Electric Corporation: This picture shows how modern lamp research is leading toward improved sight, more favorable working conditions, and more attractive living accommodations through better light.

The film traces how man has depended since the beginning of history on some form of fire or heat for light—the flaming faggot, oil lamp, candle, and the gas jet.

Following a brief introduction to the principles of luminescence, fluorescent lighting is explained, and the manufacture of the fluorescent lamp described. Successive steps show the construction of the phosphor-lined tube, the mounts as they are made and sealed to the

Continued on Page 149

Science for Society

Edited by JOSEPH SINGERMAN

• A department in which science is presented in its close relationship to the individual and in which guidance is given in causing the individual to recognize the methods of science and its vast social implications.

Resources for Civilization's Future

"We people of the twentieth century are living in the most precariously founded civilized society the world has ever seen . . ."

WITH these words, Professor J. J. Broeze opened his paper submitted to a meeting of fuel scientists at Lake Success on the morning of August 31, last. Although his paper as a whole was concerned particularly with the future outlook on fuel utilization, Dr. Broeze, of the Delft, Holland, Royal Dutch Shell Group laboratory, thus clearly stated one of the prime motivating concepts of UNSCCUR (United Nations Scientific Conference on the Conservation and Utilization of Resources). UNSCCUR was called, in the words of Secretary-General Trygve Lie, "to mobilize technical knowledge in support of one of the high purposes of the Charter—to raise the standard of living."

The fuel meeting was one of many specialized daily conferences which, together with daily Plenary Sessions constituted the basic activity of the three week conference of some 700 scientists and specialists, representing 50 nations, held in the Conference Rooms and Social and Economic Chamber at Lake Success.

In the face of present and growing critical shortages in the bounties of nature, with diminishing returns from abused agricultural and forest lands, people worldwide are demanding better living conditions. Meantime, population is increasing at a rate which promises to double the present population of this planet in ninety years. Large areas of our planet are being plundered recklessly by man, and meanwhile his number increases at a rapid pace. There is not a nation where no one is underfed, and there are nations where large numbers go hungry.

JOSEPH SINGERMAN

*High School of Commerce,
New York City*

Dangerous, Not Hopeless

THE SITUATION is dangerous, but not hopeless. Scientists in the food and agriculture sections showed how land productivity can be markedly increased by applying known scientific methods of conservation and utilization. Other, as yet, untapped sources and potential sources of food were discussed.

In surveying the world for possible extension of arable land, a covetous eye was laid upon vast unexploited lands in the tropics. But forestry experts, meeting in nearby conference rooms, aware of the increasingly critical timber situation, proposed development of economic forest reserves in these areas. On the other hand, concern was expressed over possible far reaching effects of the British project in East Africa which is clearing land to establish and extend cattle grazing.

Tremendous possibilities in sea farming were envisaged. Fish life could be scientifically nurtured and harvested. An acre of water, it was claimed, can be made more productive than an equal area of land. Studies were reported on the production of sugar by wood hydrolysis and efforts are being made to use the macroculture of unicellular organisms as a means of producing the basic food constituents, carbohydrates, proteins, fats and vitamins.

A technology called "chemurgy" has emerged, involving the use of agricultural commodities and wastes as raw materials for secondary industries. This will help extend the use of agricultural products.

Concern for Wildlife

WHILE UNSCCUR thus talked about extending food producing land, a concurrent International Technical Conference on the Protection of Nature, under the auspices of UNESCO (United Nations Educational Scientific and Cultural Organization), expressed alarm at the wanton slaughter of African wildlife to make room for cattle, and the serious threat, in fact, to wildlife in general through man's uninhibited inroads upon their shrinking domains.

Time for talking about forest conservation and utilization is likewise past. The time has come to do something about it. For a generation, with little popular recognition, there has grown a science of forestry which has opened for interested youth a promising and satisfying profession. There will be more about this in subsequent issues of *The Science Teacher*.

Demand for Minerals

THE "disquieting" problem of mineral consumption, Mr. F. Blondel, Director of the French Colonial Bureau of Geological and Mineral Studies, pointed out, will become even more critical as requirements of non-industrialized countries, "which constitute three fourths of the world, will increase considerably due to industrial development."

Some mineral deposits (tin, lead, zinc, copper, nickel, manganese, tungsten, antimony, platinum, silver, gold) are already in short supply. The future discovery of poorly exposed or concealed deposits is not expected to be worldshaking. While the next few years are expected to find wide application of improved methods of geophysical prospecting, with more intensive activity, as well as the development of substitute materials and extraction from the sea, civilization will have to stage an uphill battle.

Peoples in neglected nations are stirring for better living conditions. Contrasting the "inordinate use" of metals in nations bordering the North Atlantic with the meager consumption by the Eastern countries, Dr. D. N. Wadia, Director of the India Bureau of Mines, decried the past exploitation of the inhabitants of the East in the "role of miners . . . for wholesale export to the West." He predicted, significantly, that in the coming era of self

determination the flow of minerals and metals will be restricted, "except for more substantial gains." (In his absence, Dr. Wadia's speech was read by his compatriot, M. S. Krishnan). I considered this remark significant in view of political ferment in different parts of the world. In fact, I felt it would apply, even more significantly, to the vast and potentially productive area of China whose future political and social aspirations could not give expression at this Conference.

Minerals Wasted in War

SCIENTISTS again and again decried the unconscionable waste of huge quantities of metals, a depletable source, both in past wars and in the preparation for war. Mr. Donald H. McLoughlin, of San Francisco, depicted the "shocking wastes of war" as "overwhelmingly the worst" way in which "the mineral wealth of the planet is dissipated . . . Think of the ships," he remarked, "loaded with irreplaceable ores, concentrates and bars of metal that were sent to the bottom of the ocean, to say nothing of the destruction of industries." If the world is determined on preparation for another world war, then talk of better living conditions becomes meaningless, and inhabitants of the globe must resign themselves, at best, to a hope for a bare existence.

No dramatic or immediate results will come from the three week Conference. Some, both within and outside the Conference, felt that more would have been accomplished had the scientists been permitted to formulate conclusions and recommendations. This was a controversial question, over a period of two years, among those planning this Conference. I believe it was a mistake to expect possible benefits to accrue from permitting the scientists to make final recommendations. There was much to be lost by placing the scientists in the role of politicians. But the politicians, or diplomats if you prefer, of the world must study and act on the findings of the scientists.

The reaction stirred among participants as well as the general public was significant. It was significant, first, because it indicated the deep rooted hope for cooperative international effort, for resolving world tensions around the conference tables. Second, the

Continued on Page 144

Science Clubs at Work

Edited by MARGARET E. PATTERSON

Secretary, Science Clubs of America

• A department devoted to the recognition of the splendid work being done by science club members and their sponsors. Material for this department, such as student made projects; demonstrations and posters; outstanding club programs; state and regional meeting announcements; should be sent to Miss Patterson, Science Clubs of America, 1719 N Street, N. W., Washington 6, D. C.

Science Clubs Expand Their Activities

MARGARET E. PATTERSON

Science Service
Washington, D. C.

THE DAY when a science club had to work all alone is gone. Today science clubs are often numerous in a single school. The members meet clubs in other schools in their own and nearby cities. Clubs participate in activities on regional, district, state, national and even on an international basis.

This wide acquaintance with what other clubs are doing has led to a great diversity of activities for clubs and has contributed to the high quality of young scientists now being "graduated" from them.

International Meeting for Science Clubs

On July 16 and 17 in Paris, France, representatives from England, Denmark, Czechoslovakia, France, Finland, Holland, Uruguay and the United States met to discuss the development of science clubs and the possibility of expanding them to other countries. The persons present were leaders of science club activity in their countries and had been called together at the invitation of the United Na-

Science club in Carnegie, Pa., prepares for a science club program. (Courtesy Science Service)



Winner John Kimball of Andover, Mass., explains his work on microprojection to interested guests at the Science Talent Institute.

tions Educational, Scientific and Cultural Organization (UNESCO) to compare notes on this successful method for the popularization of science.

Since in the United States this activity has been more fully developed than elsewhere, much attention was given to the program of Science Clubs of America. Watson Davis, Director of Science Service, which administers SCA, represented the United States at the meeting.

States Provide Science Club Assistance

A FINE network of science club activities exists in 31 states, all working with the national organization in a coordinated effort to assist young scientists.

The organizations responsible for this co-

(Note: All photos courtesy Science Service)



Science fairs like this mammoth one in the Washington University Field House in St. Louis are becoming more common. They serve as a meeting for young scientists with like interests and at the same time acquaint the general public with what the boys and girls are doing in science.

operative effort are most often Junior and Senior Academies of Science but newspapers, colleges, museums and teacher organizations are also in charge of the work in some states and areas.

Getting the student scientists together is a major aim of each state program and this is achieved through local, district and state conferences held during the year. Extension departments of some colleges and universities serve to extend the program.

Almost every state has some method of communication by way of a publication which may be weekly, monthly, quarterly or annually. Most often it is student-written but those states with sufficient budgets have news sheets or bulletins edited by adult scientists.

Speakers bureaus function well in some states and radio programs in others. Some give awards to members and others reward the sponsors with scholarships, travel or other means of broadening their experience with science.

SCIENCE fairs are becoming more and more popular. Here students bring their work to have it viewed by the public and judged by scientists. A keen spirit of rivalry and competition exists and learning from each other is intensified during the days of the showing.

These are generally held in large auditoriums, field houses, gymnasiums, etc., and during the one to five days of the fair, thousands of children and adults get a fresh and new view of science. Large fairs are now being held on a regular basis in such places as Boston, Providence, Washington, D. C., Pittsburgh, Philadelphia, St. Louis and Atlanta, and others in smaller cities are well established, too. New ones are planned for the coming season in many places.

Another phase of state cooperation working with excellent results is the State Science Talent Search. These are now running concurrently with the National Science Talent Search in: Alabama, District of Columbia, Georgia, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, Montana, Pennsylvania, South Dakota, Tennessee, Virginia, West Virginia, and Wisconsin.

All entries in the state are returned there after the national judging has been completed and a board of judges, usually members of the Senior Academy of Science, then decide on the seniors to be honored in the state competition.

By means of recommendations and financial assistance hundreds of students are enabled by these state competitions to continue their education in science. Educators and scien-



Paul T. Teschan, M.D. (seated, center) of Wisconsin, top winner in the First Science Talent Search, faces the questioning of winners in the Eighth Search from Iowa, New York, California, and Washington, D. C.

tists within the states recognize the many values resulting from the program and are checking carefully on the progress of those named to insure high standards of judgment.

Science Clubs Broaden Program

INDIVIDUAL science clubs, spurred on by the increased interest at international, national and state levels are now carrying on programs that are perhaps more diversified than at any other time in the history of the movement in this country.

Following the interests of the members the program is built to suit the tastes of the club which averages about 25 members. According to their age, advancement and geographical location, they decide on what they want to do in the way of experimentation, study, demonstration and visiting.

Some of the most interesting programs are put on within the club with those in a certain

A young boy learns from students from Lutheran High School in St. Louis, Mo., how old bottles, spark coils and other assorted equipment can make fascinating experiments possible.

field demonstrating to the others the results of their work. The interchange of science among members is of considerable importance in keeping the members informed of progress in many fields.

Speakers from the outside are also popular. These may be alumni of the club or professional scientists who speak to the club about their work or science hobbies. As in the programs put on by the students themselves, there are always lively and stimulating discussion periods after the more formal part of the program is finished.

Field trips are planned by almost all science clubs. Whether in small town or large there is always much science in the industry and functioning of the community that needs investigation first hand. Some clubs take long trips to laboratories, points of scientific interest or on collecting trips. These then become social events as well as ventures to enlarge their acquaintance with science.

SERVICE to the community is an important part of club programs, too. They do this by such methods as participating in health campaigns, serving as aides in local drives for funds, beautifying unsightly areas, planting school or public grounds attractively, protecting wildlife or by any number of other ways of filling the needs of their community.

Culminating events such as are scheduled by national and state organizations to which they belong set dates in their program toward which they look forward and plan for maximum participation.



How One Teacher Does It

Some Techniques Presented by

DR. PAUL BRANDWEIN

Forest Hills High School

Forest Hills, New York

1) A teacher from New Orleans writes—"I am a general science teacher and have been trying to find a demonstration technique which will make the study of the earth's relation to the sun interesting. Students in our general science classes do not seem to work as hard on this unit as in others. We have the usual globes but we cannot afford more expensive equipment."

Get a basketball from the gymnasium, and some plastic clay, some applicators and a piece of chalk.

Then, if you don't mind a bit of fun in the classroom, have 12 students stand in an ellipse (the orbit of the earth) around a central figure (the sun). A basketball (the earth) is passed from student to student.

Notice what can be done with this simple demonstration. Each student may represent the position of the earth during a given month. In any one position a student may show the position of the earth (its tilt) by using the clay to fasten an applicator (the axis) at the correct angle. The chalk may be used to mark the position of a given city or a meridian.

The direction of the movement of the earth in its orbit around the sun, its position during the various seasons and in fact any month, can be determined. A student can show rotation by spinning the ball high up in the air; the 12 students passing the ball are demonstrating a revolution of the earth. The possibilities are endless.

2) Mr. Benjamin Towne of Stuyvesant High School, New York City, contributes this valuable method of keeping *Daphnia* alive. Those teachers who keep *Hydra* alive, or use *Daphnia* for the introductory lesson on the use of the microscope, or to study heartbeat will want to try this method.

Keeping Daphnia Cultures Alive. I have tried to keep *Daphnia* alive indefinitely, and

in experimenting, have come across a method which apparently does the trick.

I keep an aquarium going all the time, for I find aquarium water a "must" for *Daphnia* culture.

I pour aquarium water into several battery jars, and inoculate the water with *Daphnia*. Then I add a very small piece of lettuce to each jar, a sprig or two of *Elodea* and some duckweed. I also add a pinch of hardboiled egg and a very small amount of powdered dry manure to each jar. Once every week or two, depending upon the condition of the cultures, such as degree of cloudiness, density of culture, etc., I add very small amounts of hard-boiled yellow of egg, fresh lettuce, and dry manure.

The cultures must be watched for signs of cloudiness, and should it appear, re-culturing is in order.

In re-culturing, I inoculate jars containing aquarium water with *Daphnia* and repeat the feeding process as already described. The unused portions of the cloudy cultures can be poured into the aquarium for feeding goldfish.

Keeping several culture jars going enhances the chances of keeping *Daphnia* alive. It doesn't seem to matter whether the jars are kept covered or not, nor does the light intensity affect the growth. However, I would not keep the cultures in direct sunlight.

I have tried adding yeast to some of my cultures. However, I have found yeast far more effective with *Paramecia* than with *Daphnia*.—Benjamin Towne.

Huge Stock Used Microscopes

Schools or hobbyists who can be served by good used microscopes will be interested to know that the Graf-Apsco Company of Chicago now has the largest stock of used microscopes in its history. Mr. Graf states that they have five or six hundred used microscopes of various models ranging in price from as low as \$25 up. He says the instruments are adaptable to the various branches of the sciences from the hobbyist to the most exacting work of the laboratory technician.

THE SCIENCE TEACHER

Membership News and Notes

By ROBERT H. CARLETON, *Executive Secretary, NSTA*

IMPORTANT to the health and strength of any professional association, such as NSTA, is the feeling among its members that they "know" one another and are united in a program of action directed toward worthwhile goals. On this score, the condition of NSTA is good. The purpose of *Membership News and Notes* is to help preserve and improve this condition. As successor to *This and That*, which for several years was ably handled by our retiring president, Norman R. D. Jones, this column will attempt to report news items about high spots in the activities of the association and its members.

Meetings

The annual summer meeting of NSTA (at the time and place of the NEA Delegate Assembly) includes the principal business sessions of our board of directors. The 1949 meeting at Boston produced board actions that will guide NSTA policies and activities for some time to come (see brief report on p. 119). The annual winter meeting (at the time and place of the AAAS) has produced some outstanding professional sessions. This year's forthcoming meeting promises to continue the tradition. An announcement of the 1949 meeting in New York City appears on p. 139 of this issue.

The NSTA Regional Conference on Industry-Science Teaching Relations held at Pittsburgh, Pa., September 30, will be reported in the December issue of *The Science Teacher*.

Always a high spot among meetings in science education, this year's convention of the Central Association of Science and Mathematics Teachers will be held in Chicago November 25-26. For details, consult *School Science and Mathematics* or write to Dr. Charlotte L. Grant, Oak Park High School, Oak Park, Ill. Dr. Grant, an NSTA director, is also president of CASMT.

Membership

ONE OF the satisfying features of last year's climb to a new high in NSTA membership (4,405) was the fine response to our special

one dollar rate for students enrolled as prospective science teachers in our various training institutions. Outstanding responses came from the University of Pittsburgh, Muskingum (Ohio) College, Teachers College of Columbia University, Terre Haute State Teachers College, West Chester (Pa.) State Teachers College, and Northwestern University. However, more than twenty other institutions helped swell the total of student memberships to around 300. About 100 student members are already enrolled in NSTA for 1949-50. Recent summer school and workshop sessions at Oregon State College, University of Pittsburgh, Columbia University, and George Peabody College for Teachers produced fully 100 NSTA memberships, most of them first-time, regular members.

Speaking of workshops, about next April we should be able to send NSTA members a pamphlet listing all 1950 summer workshops and special courses or offerings in science education. Compilation of such information has already started. The resulting bulletin will be published and distributed through the generous cooperation of the Education Section of General Mills, Inc. All persons in charge of such summer programs in science education should immediately advise the Executive Secretary of NSTA of their wish to be listed, and should send complete information and details as soon as possible.

Bulletins

NSTA has consistently exerted its energies in behalf of more time and better facilities for laboratory and demonstration teaching in science. The 1947-48 bulletin, *Teaching Conditions and the Work Week of High School Science Teachers*, argues the point very well. There is reason to believe this bulletin will have much beneficial influence among the administrative groups who received copies. It is gratifying, also, to have received numerous requests for the bulletin from industrialists who read its announcement in *Chemical and Engineering News*.

Suggestions for teaching elementary science

through experimental activities are set forth in the special bulletin, *Safety Thru Elementary Science*, which was mailed to all NSTA members early in September. Both of these bulletins were part of NSTA membership service for 1948-49. New 1949-50 members may procure copies by sending seventy-five cents to NSTA Headquarters. The 1947-48 bulletin is twenty-five cents, the elementary science bulletin fifty cents.

Our committee on apparatus and equipment is contributing to our efforts to encourage more and better laboratory teaching in science (see p. 140) and may also have a special report for us before the year is over. Under the chairmanship of Dr. Walter S. Lapp, Eastern Regional Vice-President, this committee is spearheading an experimental study of the comparative costs of borosilicate glass and soda glass test tubes as ordinarily used in high school laboratories. Chemistry teachers in about fifty schools and their several hundred students are cooperating in the experiment which has been made possible by a grant-in-aid from the W. M. Welch Manufacturing Company. The committee expects to study other similar questions and problems relating to laboratory equipment. Their findings will be published when available.

People

FOR THE fourth successive year, Dr. Morris F. Meister has been named chairman of the board of judges to determine the winners of two \$1,000 George Westinghouse Science Writing Awards. NSTA shares in this honor as Dr. Meister's appointment is in the name of our Association. Principal of the High School of Science in New York City, Dr. Meister is a past-president of NSTA; he is chairman of the Advisory Council on Industry-Science Teaching Relations and was elected this spring to a three-year term on the Board of Directors.

We learn with regret that Dr. Otto J. Walrath died at his home in Bloomfield, N. J., last July after an illness of six months. He was 62 years old. Dr. Walrath was for more than thirty years a teacher of physics and chemistry and head of the science department in Bloomfield High School. He had retired from this position in June, 1948. Author

of numerous articles for scientific and educational journals, Dr. Walrath also wrote a textbook of high school chemistry. He was graduated in 1909 from Union College, which in 1934 awarded him an honorary doctor of science degree. He received a master of science degree from New York University in 1914. In addition to membership in NSTA, Dr. Walrath was a member of the American Chemical Society, the Chemistry Teachers Club of New York City, the New Jersey Science Teachers Association, and several other professional societies. He was a member of Sigma Xi fraternity.

SCIENTIST and science educator J. O. Frank also passed away last August at the age of 64. He had been ill for several weeks. Mr. Frank was professor of chemistry and science teaching at Oshkosh State Teachers College for 37 years. His publications and lectures in these fields made him nationally known. He received his bachelor's degree from Indiana University in 1909 and his master's degree in 1912. He did advanced graduate work at the University of Wisconsin, the University of Chicago, Columbia University, and the State University of Iowa. He served as visiting professor during summer sessions at several major universities throughout the country. Mr. Frank is credited with preparation of the first aluminum-barium alloy. He also engaged in research on salts of selenic acid, wood preservation, and new types of glue. Professional societies in which he held membership included the American Chemical Society, the American Association for the Advancement of Science, the Central Association of Science and Mathematics Teachers, and the National Association for Research in Science Teaching.

Dr. Jan Koning and his wife, Ini, sailed for their home in Dordrecht, Holland, July 22 after a four-months visit in this country to observe "science education in action." More than 50 NSTA members served as hosts to the Konings during their coast-to-coast journey. Dr. Koning was particularly interested in chemical education, science for general education, and newer techniques of evaluation and guidance in science teaching. Dr.

Continued on Page 137



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MEMBERSHIP NEWS

Continued from Page 134

Koning was well on his way toward a doctorate in chemistry at the University of Utrecht when the war broke out, but demolished and closed laboratories made it impossible for him to complete this work. It was then that he turned his time and energies to other interests and, as he puts it, "grew up to science education." He completed his doctorate in this field during the war years. His impressions of science education in America were gleaned from visits to schools ranging from a Nebraska high school of less than fifty students to general and specialized city high schools enrolling up to 5,000 students. On the whole, his impressions were favorable although not without some criticisms. Dr. Koning spoke informally at the Boston meeting. Perhaps we can entice a journal article from him before long.

Betty Lockwood, an NSTA Director and President-elect of the National Association of Biology Teachers, has accepted a new position with the National Foundation for Infantile Paralysis. While a teacher of biology in Detroit, Betty took a leave of absence to work for a doctor's degree in public health at Harvard. Upon completing her doctorate, she accepted appointment as assistant professor in the Harvard School of Public Health. Much of her work in this capacity during the past two years has been as a consultant on programs of health and nutrition in the public schools of Massachusetts. Dr. Lockwood's new position will doubtless offer important new opportunities for service to challenge her talents and experience.

Fred B. Tuttle, an NSTA member, has resigned as education specialist with the Civil Aeronautics Authority in order to accept the post of superintendent of schools in Westerly, Rhode Island. Dr. Tuttle has been much interested in the work of the Advisory Council and will no doubt grasp every opportunity to tell the story of NSTA to science teachers and science industries in his new locality.

Recent visitors to Headquarters in Washington included R. H. Jordan of Florida State College and J. Ross Young, Mrs. Young, and their eleven-year old son of Cambridge, Illinois. Professor Jordan is head of the science

department in the General Education Division of Florida State College. Mr. Young teaches chemistry, biology, and general science in the Cambridge high school. But "traditional" courses do not meet the needs of his situation, in which agricultural interests predominate but in which pre-college training also must be provided for many students bent on business and professional careers. His courses, therefore, are tailor-made for his group of students. And this fall Mr. Young has the pleasant experience of teaching these courses in a new building and in new laboratories which he himself designed. Mr. Young "paid" for his visit to Headquarters and his tour of the NEA building by agreeing to serve as an NSTA field representative for his area.

AFTER several years service as a science teacher in the Fairfield, Connecticut, high school, Walter H. Hellman has been promoted to assistant superintendent of schools in Fairfield. In addition to active membership in NSTA, Mr. Hellman has been an officer in the Metropolitan Bridgeport Science Teachers Association which recently became NSTA Affiliated Group No. 41. Through the efforts of this group, Mr. Ray Lumley, Science Consultant, State Department of Education, is taking the lead in forming other similar science groups throughout Connecticut. A statewide science teachers group is expected to form at the October convention of the Connecticut State Teachers Association. Invitation to all these groups to become NSTA Affiliates is, of course, earnestly extended. Gerhard H. Coler is president of the Metropolitan Bridgeport Science Teachers Association.

John M. Roth assumed new duties this fall as teacher of 8th and 9th grade science in the training school of the Millersville (Pa.) State Teachers College. He will also be in charge of teacher training in this field. Mr. Roth was for several years teacher of general science in the New Castle, Delaware, high school. He operates a camp for 'teen-agers in Maine each summer. Mr. Roth has written several articles for educational and outdoor magazines, and was a participant in the Consultation Conference arranged by NSTA last March for the Better Light Better Sight Bureau.

Continued on Page 148

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Second Cooperative Meeting

ENCOURAGED by the success of last year's cooperative meeting, the major science teaching societies affiliated with the American Association for the Advancement of Science will hold a second series of joint meetings in New York City, December 27-30.

The American Nature Study Society, the National Association of Biology Teachers, and the National Science Teachers Association will hold separate and joint sessions. The AAAS Cooperative Committee on the Teaching of Science and Mathematics will also participate in some of the sessions. Headquarters rooms for the societies and meeting rooms for the sessions have been reserved at the New Yorker Hotel, which has also set aside 1,200 guest rooms for members of the groups.

Joint sessions are planned for the mornings of December 27, 28, and 29. On the 27th, the program will center on the theme of "Science in General Education" and is in the charge of the Cooperative Committee of the AAAS with participants from each of the other cooperating groups. A program giving emphasis to problems in the teaching of biological sciences is scheduled for the 28th. The Federation of Science Teacher Associations of New York City has assumed responsibility for planning and conducting the joint session on the 29th. A large number of field trips will be available all day on Friday the 30th. A special nature study field trip will be arranged by ANSS and NABT, and the New York City Federation of Science Teacher Associations has promised half a dozen other trips to various places of interest.

AFTERNOONS of the 27th and 28th will be taken up by individual sessions of the societies. NSTA sessions will be as follows: December 27, a program dealing with the teaching of the physical sciences, in cooperation with the National Council of Teachers of Mathematics; December 28, third national conference on Industry-Science Teaching Relations, centering around the work and projected activities of the NSTA Advisory Council on Industry-Science Teaching Relations.

The Fourth Annual Junior Scientists Assembly is scheduled for the afternoon of

December 29. The Cooperative Committee will also conduct a symposium this same afternoon, but the two program items will not conflict in time.

The societies will hold a joint banquet in the Grand Ballroom of the New Yorker on Thursday evening, December 29. Heads of the societies will offer brief remarks and there will be a program on a topic of general interest to all.

Wednesday evening, December 28, has been cleared in deference to the AAAS presidential session and reception.

Business sessions of the various societies will be held at scheduled hours throughout the week. An exhibit of non-commercial organizations, their activities and their services, will be held in the Grand Ballroom all day of the 29th.

Details of the total program for the cooperative meeting are still in the process of formulation. However, it is expected that printed copies of the final program will be ready for mailing to all members of the cooperating societies by December 1.

SINCE THE entire AAAS and most of its affiliated societies will be meeting at this same time, it is suggested that hotel reservations be made as early as possible. There will no doubt be plenty of sleeping rooms, but early reservations afford the best choice. Pending the mailing of the printed program, reservation application forms may be obtained by writing the NSTA Headquarters Office, 1201 Sixteenth St., N.W., Washington 6, D. C.

Here is the AAAS statement of policy on registration: The AAAS will not enforce registration, but it is doing everything possible to encourage registration. The Association will appreciate greatly the full cooperation of each society in securing as high a degree of registration as possible. In general, it is hoped that each person who attends the New York Meeting will realize that the Registration Fee—purposely kept at a moderate figure—is necessary to meet the many general expenses and will pay it cheerfully as a matter of principle.

NSTA appreciates the support and encour-

agement of the AAAS in promoting the co-operative meeting of its affiliated science teaching societies and the many other forms of assistance rendered by this parent body of scientists. It is hoped that many NSTA members in attendance at the December 27-30 meetings will stop off at the Penn Top of the Statler Hotel and pay the AAAS Registration Fee.

ATOMIC POWER PLANT

The proper temperature at which to operate an atomic power plant is one of the problems engaging the attention of General Electric scientists and engineers who are operating the Knolls Atomic Power Laboratory in Schenectady for the Atomic Energy Commission. Dr. Kenneth H. Kingdom, assistant director of the General Electric Research Laboratory, who is in charge of the atomic power studies, says that atomic fuel can supply heat at any temperature up to millions of degrees. However, he adds, an operating limit is set by the characteristics of the materials used.

As part of its work for the A.E.C., General Electric is now designing an experimental atomic power plant to be erected on a 4,500-acre tract near West Milton, New York. This plant will operate at as low a temperature as possible to minimize corrosion and other problems.

ILLINOIS CHEMISTRY TEACHERS

The Illinois Association of Chemistry Teachers will hold its fall meeting at DeKalb Saturday, October 29, according to its president, Clyde W. DeWalt. Both college and industrial chemists make up the program. Professor Dole of Northwestern University will discuss his research on synthetic textiles and show movies of his recent work.

DETROIT MEETING

The National Association of Biology Teachers in conjunction with the Detroit Biology Club is holding a regional meeting November 19 at the Cranbrook Institute of Science, Bloomfield Hills, Michigan.

NSTA APPARATUS COMMITTEE

This committee is planning an exhibition for the next meeting of the NSTA to be held at Hotel New Yorker next December. Many teachers have developed their own special ideas, methods or gadgets for teaching certain scientific facts and principles. Here is an opportunity for all teachers to exhibit any materials they may have along such lines. Due credit will be given to all who enter exhibits.

All who have anything to exhibit should inform the chairman at once. Ideas and entries from all levels and all teaching fields will be welcome. Send full details concerning the general nature and purpose of the exhibit. State the width, height and weight of the material to be submitted. Also indicate whether electrical or other services will be required. Do not delay. Write now to:

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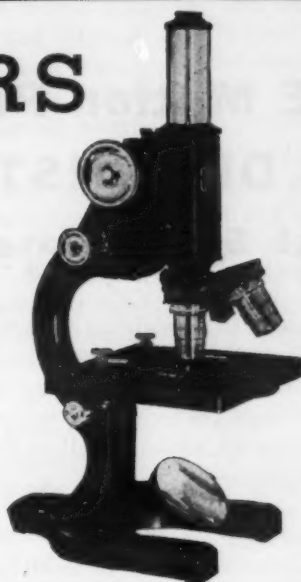
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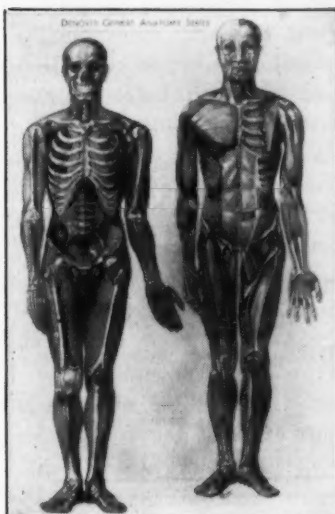
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ILLUMINATION

Continued from Page 122

of light from surfaces is classed mainly into three classes; specular, spread, and diffused.

Specular reflection is that obtained from a highly polished surface in which very little distortion is present in the reflected image. A mirror is an example.

Spread reflection is that caused by light striking a rough surface, such as a semi-gloss rough plaster wall or a sheet of crinkled tin foil. The reflection is partially distorted, or the light is reflected from the surface at many angles other than the angle of incidence of the light as it strikes the surface.

Diffused reflection results when light strikes a mat surface, such as a piece of white blotting paper. The reflected light is completely diffused or spread from the surface of the paper.

TRANSMISSION of light is important in the design of a glass enclosed luminaire, since the efficiency of such a luminaire is largely dependent upon the transmission factor of the glass. Usually a certain amount of diffusion accompanies the transmission of light through a surface. Refraction, or bending of light rays, as in the case of a prismatic luminaire, can be used to direct the transmitted light to a desired region. Transmission of light occurs in two types of material: transparent and translucent. Transparent material will transmit light with very little distortion, making it possible to see objects through it. Translucent material will diffuse the transmitted light making it impossible for objects to be seen through it.

When light strikes a surface, one of three phenomena must occur; the light must be either reflected, transmitted or absorbed. In other words, the sum of the reflection, transmission, and absorption factors must equal 100 percent. Using samples of transparent, translucent material, and opaque materials, the reflection and transmission factors may be determined for these materials by means of a foot candle meter as described in Article II of this series (*The Science Teacher*, Vol. XVI, No. 1, Feb., 1949). In measuring the reflection factor, the sample must be placed

on a dull black background so that the reflectance from the surroundings does not affect the reading. Knowing these two factors for a specific material, the absorption factor of the material can be determined by subtracting the sum of the reflection and transmission factor from 100 percent.

Refraction or bending of light rays can be demonstrated by using a sharply focused flashlight and a prism in a darkened room. Also, by proper adjustment, complete light reflection can be obtained. These principles are used extensively in the design of prismatic glass luminaires. See Figure 2.

THE distribution photometer can be used to obtain the candlepower distribution of each of the five classes of luminaires. Plotting this information on polar coordinates, a distribution curve for the luminaire can be obtained as described in Article III of this series. Such a curve is important in the choosing of the proper luminaire for a specific purpose, since it represents graphically the distribution of light from the unit. The distribution curve also enables one to determine the zonal lumens, mentioned above.

The position of the lamp in the luminaire and the shape of the luminaire are extremely important in luminaire design, since these two factors determine how the light will be reflected or transmitted by the luminaire surface. The effect of these factors can be demonstrated by using the capped light ray source and polished surface reflector sections (See Figure 3). By moving the reflector sections, circular, hyperbolic, parabolic, etc., into various positions with respect to the capped light ray source, the focusing or spreading of light rays reflected from the polished surface may be shown. In addition, the focal point of the reflector may be found where the light rays will reflect back through the lamp, reinforcing the lamp output.

Bibliography

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- I. E. S. *Lighting Handbook*, 1st Edition, Illum. Eng. Soc., 51 Madison Avenue, New York, N. Y.

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RESOURCES

Continued from Page 128

reaction revealed a tremendous respect for the scientist, a faith in his methods, a belief that the method of the scientist, applied to critical problems of these times, would dissolve the different kinds of curtains that have been erected to breed fear and suspicion.

Scientific Statesmanship Needed

THE Conference, carried out with considerable effort, can prove to have been worthwhile. Evaluation will have to await time and the vicissitudes of man. It will prove to have been worthwhile if the statesmen of the world come to realize that survival of civilization is predicated on getting together around the conference tables, with the scientists at their elbows. It is no academic issue; for civilization, it is a question of survival. Man needs an era of scientific statesmanship. Man will have to adopt a new way of life. Thinking will have to be on a global basis—for a global civilization. Anything short of one world will lead downstream for all.

The Conference will prove to have been worthwhile if recognition is given to the strivings for conserving and utilizing natural resources for human welfare rather than exploiting the earth with private economic gain as the only motivating force.

Education will have to play a vital part in a bold program of conservation and utilization of resources. Yet, American educators took no part in these proceedings. There is a hope that there will be future progress conferences of UNSCCUR; and I would like to see education occupying its rightful place therein.

Generally, participants seemed hopeful for the future. Personal reaction of individual scientists ranged from one of questionable outlook for future generations to that of Mr. Donald H. McLoughlin who felt that "the possibility—or rather the probability—of scientific miracles and technological developments beyond our present understanding," are by no means vane hopes.

"Unless we can hold out to mankind, and I mean all mankind," said Mr. James Thorn, President of the Economic and Social Coun-

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cil, at a closing session of UNSCCUR, "a realistic hope of improving living standards, the world will never escape from the shadows of war."

Those who had followed this Conference thoughtfully hoped for some concrete basis for expecting future realization of the many possibilities envisaged for a better life for man. Mr. Stephen Raushenbush, Economic Consultant to the United Nations, participating in the closing discussions, reported tersely and pointedly of responses by representatives of finance that considerations of profit and control did not encourage them to make capital investment in the undeveloped countries. It was obvious that final decision is not in the hands of the scientists.

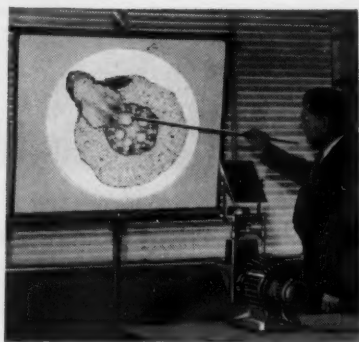
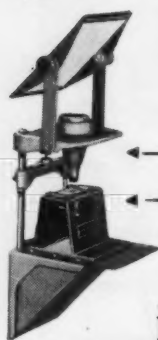
THE scientific and technical experts had their own individual ideas about ways and means of utilizing our amassed knowledge and technical know-how; and sometimes they ex-

pressed them. There were those who strongly advocated "free enterprise," the credo that built America, although it was not obvious how undeveloped countries were to grasp this pattern in the present state of world economics. M. Jolain of France felt that a country must manage and develop its forests. But, Mr. G. C. Monture asked for freedom from government interference, and assurance of economic and political stability, to warrant exploitation of mineral resources.

Mr. Arthur E. Goldschmidt, Assistant to the U. S. Secretary of the Interior, alluding to the undeveloped countries, pointedly remarked, "A farmer cannot afford the conservation tools which his nation cannot afford he neglect." If I may take the liberty of paraphrasing, I might suggest that the undeveloped nation cannot afford the conservation and production methods which the world cannot afford it neglect.

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FLEAS

Continued from Page 117

ectria, as well as of *Calonectria*, *Hypocrella*, and other closely related genera, are not infrequently encountered on scale insects in various parts of the world.

Many people have seen on window panes, on mirrors, on varnished surfaces, or in other positions about buildings a mold that kills house flies which remain attached on such surfaces. This fungus, known as *Empusa muscae*, represents an order of fungi whose species are almost all insect parasites. The house fly fungus is widely distributed in the United States, Europe, and South America, occurring in greatest abundance here from the latter part of June until late autumn. Infected flies usually settle on smooth surfaces, such as in some of the places just mentioned, and remain there when dead. The area around such dead flies soon becomes covered with a halo of white spores that have been discharged forcibly from specialized hyphae which protrude from soft areas of the exoskeleton of the insect. Other species of the genus *Empusa* and of the related genus *Entomophthora* parasitize leaf-hoppers, small flies, Ichneumon flies, crane flies (Fig. 6), small bees, aphids, thrips, lepidopterous larvae, grasshoppers, the imagoes of caddis flies, and representatives of other insect groups.

Belonging to the same group of fungi in which *Empusa* and *Entomophthora* are placed is a remarkable fungal parasite, *Massospora cicadina*, which attacks the periodical cicada (seventeen year locust). Whenever a brood of this insect appears, it is usually possible to find from a few to many individuals which are parasitized by *Massospora*. The fungus develops in the abdominal segments from the posterior end forward, and has been found much more frequently infecting males than females. The parasite does not kill its host immediately and as additional segments become consumed, these may be sloughed off until only the thorax and two or three abdominal segments remain. It is an experience one long remembers to see infected individuals in this condition crawling or flying about among others of a brood and spreading the disease.

CHATS

Continued from Page 123

1. *The diaries give evidence as to the effectiveness of teaching.* Topics that are well treated in many diaries have been well received by the class. The converse, of course, is true.

2. *The diaries give insight into what the students are really thinking*—their true reactions to the course. In this respect the diaries are far superior to formal assignments of written work.

3. *Diaries offer opportunity for the teacher's constructive comments*, to individuals and to the entire class, each time they are returned. Unique thoughts from good diaries should be quoted, with or without names as judgment dictates. Misunderstandings, especially if expressed in several diaries, should be corrected. Always there is a place for good-natured humor in these comments.

4. *The diaries indicate those topics of a course that are more suitable, and less suitable.* This may guide the major and minor revisions of the course for offering next year.

5. *The diaries provide a superior basis for ranking students as to alertness, interest, and ability.* This evaluation is of increasing significance as classes become larger. It is a fair substitute for the ideal judgment based on close personal relationships between a teacher and each student, which is only possible in small classes.

It is to be hoped that the science teacher is permitted to consider a student's rank in alertness, interest, and ability as a factor in his final grade. The idea that "it all depends upon the last examination" (still held by some administrators) is the crudest attitude toward measures of achievement.

6. *The diaries offer a broad basis for better questions on the final examination.* As an addition to the items that test pure memory, let appreciation and discrimination be given a play by this: "What five topics in this month's (quarter's, semester's) study seemed most worthwhile to you? Give reasons for your answer."

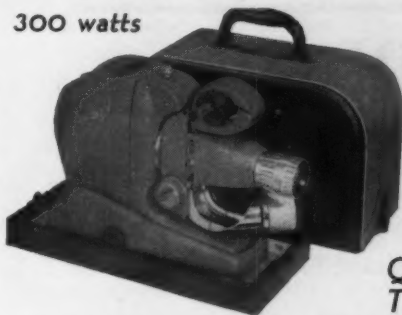
Many young folks who gaily throw away their formal note books will keep their diaries. Pride of personal expression has gone into

Continued on Page 148

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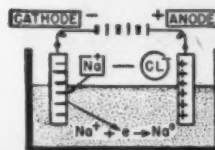


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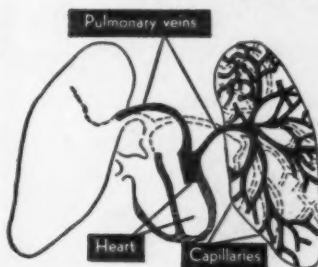


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CHATS

Continued from Page 147

the writing of even the more modest ones—"a poor thing, but mine own!" In later decades mature men and women will look at the pages again, and say: "This class in science has stayed with me even until now!" It is thus with diaries.

MEMBERSHIP NEWS

Continued from Page 137

At Random

Did you know that you can obtain free of charge a Teachers Kit on "Weather" that includes pictures of cloud forms, and several booklets on weather observing and forecasting? Send your request to the U. S. Weather Bureau, Washington 25, D. C.

How many schools can match the record of Ann Arbor, Michigan, high school in having had only two head physics teachers over a span of 76 years? Mahlon H. Buell, a member of NSTA, is now in his 28th year in this position. His predecessor was Horatio N. Chute (remember the Carhart and Chute high school physics textbooks?), who began teaching there in 1873, eight years after the close of the Civil War. There were few courses in physics in those days and fewer laboratories. However, physics was required in AAHS and Chute pioneered in the laboratory teaching of the course. He taught the classes and supervised the laboratory, but he had an assistant who actually conducted the laboratory work. Chute's work week consisted of teaching four 55-minute classes four days a week, all in the forenoon. (Compare this with present work-week schedules reported in the 1947-48 Bulletin!) He kept Tuesdays completely clear for grading students' notebooks, in which he required extreme neatness. During his term in AAHS the marking system was changed several times. The letter system was to be introduced in the fall of 1922. That was the last straw. Chute would not change again so he retired in June, 1922. He had taught for 49 years in Ann Arbor High School. Buell points out that many of his students today are using some of the same equipment their parents and grandparents used.

THE SCIENCE TEACHER

His laboratory is equipped with fifteen duplicate sets of equipment for practically every experiment that is done. The secret, says Mr. Buell, is to "get something new every year, take good care of it—and keep it in use for 76 years."

WRITING to accept appointment as an NSTA field representative, Ralph H. Hall, associate professor in the Atlanta Division of the University of Georgia, had this to say: "I hope that before long all the science teachers in the United States will realize the wonderful service that the NSTA is doing for them." You can help attain this goal. Show your colleagues *The Science Teacher*; show them the *packets of science information*; show them the *bulletins* that NSTA members receive. Tell them what NSTA is and what it does. Then give them a membership application form and point out that the dues are only \$2 a year. And we'll soon reach our goal of 10,000 members.

AUDIO-VISUAL AIDS

Continued from Page 126

ends of the tube, the precise amounts of mercury and argon gas injected, and the lead wires being attached.

EXPLORING WITH X-RAYS—(16mm and 35mm; length 40 min.)—produced and distributed by General Electric Corporation. Comprehensive coverage is given to the fascinating story of x-rays, from their discovery of more than half a century ago to more recent developments.

The film shows how x-rays were discovered in a quiet university laboratory late in the nineteenth century, how they were produced with crude apparatus, how scientists all over the world experimented with them, and how they were welcomed by medicine. The picture then shows how today's new and more powerful equipment has been put to new uses in medicine, dentistry and industry.

CURVES OF COLOR—(16mm color; length 10 min.)—produced and distributed

Continued on Page 152

A High School Physics Text by

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BIOLOGY IN DAILY LIFE. Francis D. Curtis, University of Michigan, and John Unban, New York State College for Teachers at Buffalo. Ginn and Company, New York. 1949. 608 pp. 18.5x24.5 cm. illus. \$3.60.

Biology in Daily Life has been written for all the pupils in high-school biology classes. For the general student it provides the practical education which every boy or girl needs, regardless of what his or her future may be. It provides adequate preparation for the future college student. This up-to-date new book directly appeals to the pupil's interests with sections on "Consumer Biology," "Biology in the News," and "Biology Out-of-Doors."

This book has been planned to facilitate adjustment not only to differences among pupils, but also to the interests, needs, and capacities of different classes. The frequent recurring groups of tests are intended primarily as a self-testing device. Tests in the book are supplemented abundantly by the *Tests to Accompany Biology in Daily Life*. The *Workbook to Accompany Biology in Daily Life* both implements and supplements the text with abundant and varied additional activities. A *Teachers' Manual and Key* presents lists of motion pictures, apparatus, and professional readings, as well as other materials of practical value to teachers of biology.

ALCOHOL AND HUMAN AFFAIRS. Willard B. Spalding, Dean of the College of Education, University of Illinois, and John R. Montague, M. D., Clinical Associate in Medicine, University of Oregon Medical School. World Book Company, Yonkers-on-Hudson, New York. 1949. 248 pp. 14x19.5 cm.

The aim of this book is to present factual information drawn from many sources of the problem of excessive drinking of alcoholic beverages which has been called America's *Number 1* public health problem. The authors have tried to present many facts on many sides of the problem. They have tried to show that there is both good and bad in the manufacture, sale, and use of alcoholic beverages. They have tried to show what different people believe should be done about the use of liquor. They have tried to show the way in which intelligent people look at a complicated problem on which the citizenry is divided. The book includes chapters on the background of the problem, the manufacture of alcohol, its effect on the body and on society, how drinking is controlled by law, religion and the use of alcohol, what can be done to help alcoholics, and has an appendix on tobacco and narcotics.

SCIENCE AND YOU. LIVING WITH SCIENCE. OUR SURROUNDINGS. (Series for grades seven, eight, and nine, respectively). George W. Fowler, Sampson College, Geneva, New York; Morton C. Collister, formerly Principal of Baldwin High School, Baldwin, New York; and Ernest L. Thurston, formerly Superintendent of Schools, Washington, D. C. The Iroquois Publishing Company, Inc., Syracuse, New York. 1948. 378, 544, and 757 pp. respectively. illus.

The three books in this general science series tell a story of science that the student will enjoy reading. The material is well organized; the style is clear and readable. A ten point unit organization is followed throughout: (1) an introductory picture, (2) a forward look, (3) preview questions, (4) the unit text divided into problems, (5) illustrations and diagrams to illuminate and elaborate

the text story, (6) "Some Thought Questions", (7) a very human biography of some scientist who made contributions to the field covered by the unit, (8) "Looking Backward Over the Unit", (9) self-tests, and (10) "Some Things to Do" giving suggestions for student and science-club activities.

Special helpful features include a bibliography of books and films, a complete glossary of important scientific terms used in the text, and a detailed, cross-reference index.

GENERAL BIOLOGY. Perry D. Strausbaugh, Professor of Botany, West Virginia University, and Bernal R. Weimer, Professor of Biology, Bethany College, West Virginia. John Wiley and Sons, Inc., New York, 1947. 718 pp. 14½ x 22 cm.

The second edition of *General Biology*, a well-organized text on the college level, presents the fundamentals of biology in a one-year course. The new edition has been largely rewritten, though the general plan of organization of the first edition has been retained. The last chapter of the first edition, rewritten and enlarged, is the first chapter of the new edition. A fine chapter on hormones—production of by glands, interrelations, etc.—has been added. Inclusion of the results of recent investigations on both hormones and vitamins have brought these items up to date. Sections on bacteria, genetics, evolution and conservation have been extended.

The opening chapter presents a discussion of the biological field, followed by a chapter on the nature and characteristics of life. Several chapters are devoted to a detailed treatise on metabolism and related factors; food manufacture (including osmosis, photosynthesis, plant anatomy and physiology, etc.); digestion and absorption in plants and animals (including enzymatic action, nutrition, vitamins, etc.); food transportation and distribution; energy release and respiration; excretion of wastes; cycles in nature, etc. This is followed by a discussion of the adjustments that organisms make to their environment, such as by tropisms, through the nervous system, etc. Growth, reproduction, and inheritance are well treated in the two chapters given to them.

The text is well illustrated with numerous diagrams, photographs, and pictures, a number of which are in color. The index and glossary have been combined. The text might also be used in the high school science reference library.

SCIENTISTS AND AMATEURS—A HISTORY OF THE ROYAL SOCIETY. Dorothy Stimson, Chairman of the History Department, Goucher College, Baltimore. Henry Schuman, Inc., New York, 1948. 279 pp. 15x21.5 cm. \$4.00.

This is the first authoritative book for the general reader to tell the story of the world's oldest scientific body in continuous existence—the Royal Society of London. All of the Royal Society's important history is here, from its chartering in 1662, in that brilliant age when England was building the foundations for great scientific advances, down to the present day.

Colorful portraits are given of the great scientific pioneers of all time, early members of the Royal Society in what was truly an Age of Genius—among them Robert Boyle, Isaac Newton, Christopher Wren, Edmund Halley, and Robert Hooke—men who helped to introduce systematic experimental

tion into science. This book tells the story of this body of experimenters and science-loving amateurs at work creating a center where new science could be fostered; devising laboratory facilities as best they could; making and improving instruments; experimenting along greatly varied lines of research; maintaining correspondence with foreign scientists; and establishing the first organ of international scientific communication in the famous *Philosophical Transactions*, which is still in existence today.

THE RADIO AMATEUR'S HANDBOOK, 1949 Edition. Headquarters Staff of the American Radio Relay League. Published by American Radio Relay League, West Hartford, Conn., 1949. 605 + 118 pp. 16½x24x cm. 1,651 illus. \$2.00 net in the United States and Canada; \$2.50 elsewhere.

This twenty-sixth edition of *The Radio Amateur's Handbook* presents a very thorough treatise of modern amateur radio communication. It covers the entire field from the basic fundamentals to the latest techniques in singleband telephony.

The book has been brought up to date. The chapter on high-frequency receivers presents up-to-the-minute information in single-sideband telephony receiving technique. Also included is much constructional material such as an ultra-simple beginners' receiver, improved audio noise limiter, selective i. f. amplifiers, band switching preselectors, crystal-controlled converters and n. f. m. adapters. A handy new section on practical filter design is included in the power-supply chapter.

Numerous charts, graphs and miscellaneous data are grouped for easy reference. The practical vacuum-tube data tables are completely up-to-date.

This book is not only a must for the radio amateur but very desirable for the science library.

TEXTBOOK OF GENERAL ZOOLOGY. Winterton C. Curtis, Professor Emeritus of Zoology, and Mary J. Guthrie, Professor of Zoology, University of Missouri. John Wiley and Sons, Inc., New York, 1947. 794 pp. 15½ x 23½ cm. \$4.50.

The book, *Textbook of General Zoology*, is a well-organized, detailed study of the facts concerning structure and function in animals; and it represents, in its fourth edition, a careful editing and revision of text and illustrations of its predecessor. Chapters on the animal kingdom have been extended in places, and an additional chapter on the organ systems of invertebrates has been included which will facilitate comparisons with vertebrate organ systems, as well as to serve as a review of the chapters on invertebrates.

The approach is through a study of vertebrate anatomy, morphology and physiology, as organ systems related to metabolism and irritability cells in multicellular animals, and reproduction and development in chordates. This is followed by a study of biological principles, including heredity and variation, taxonomy, and the organization of the animal body. The invertebrates are presented phylogenetically in eleven chapters in considerable detail, and are followed by a chapter on the chordates. Principles of ecology and historical data appear in the text at opportune places rather than in separate sections.

While the text was designed for college use, it would also make a welcome addition to the high school science reference library.—R. D.

OCTOBER, 1949

Science Projects

In Biology, Chemistry
and General Science

Chemistry Projects

(Revised, 1947)

Enlarged and Printed

In this group are found examination and purification of water; testing of lubricating oil, paint, baking powder, wool, silk, cotton, rayon and linen; electroplating; metal working; hydrogenation of oil; getting sugar from corn; tanning leather and fur; making bakelite; cold cream and vanishing cream, mirrors, ink, polish, and plastic wood.

176 Pages, Printed.....\$1.85

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(Revised, 1948)

Included among these projects are: loss of soil elements by leaching, test tube plants and root hairs, food elements of plants, how to make a cross section of a stem, using light to make glucose and starch, when plants breathe like people, heat of respiration in plants, what causes liquids to flow in plants, identification of trees, the house fly and what he carries, controlling insect pests, digestion, checking your posture for health, charting your teeth, susceptibility to tooth decay, media of correct pH to grow bacteria.

61 Projects, 160 pages - - - \$1.85

General Science Projects

(Published, October, 1942)

Among the projects are the following: amateur range finding, how to navigate by sun and stars, weighing without scales, making and using solutions, seven ways to start a fire, seven ways to put out a fire, chemical indicators, a rock mineral collection, a pin hole camera, printing pictures, learning to be a radio amateur, a pendulum project, testing foods at home, digesting food with saliva, canning food, how good are the arches in your feet, surveying the teeth, and clay modeling and casting.

34 Projects, 95 pages,
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Science Publications

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AUDIO-VISUAL AIDS

Continued from Page 149

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C. R. Crakes.

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Of *The Science Teacher*, published 4 times per year at Normal, Illinois, for October, 1949.

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